COMPUTER-ASSISTED TICKETING SYSTEM WITH MULTIPLE OPERATORS

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The present invention relates to ticketing systems which can be used simultaneously by several operators in a manner which is transparent to the user.

Ticketing system means a system in which there is a dual one transaction - one contract association (this is the case for example with transport systems) or a multiple one contract - n transactions association (that is to say each time there is a transaction there is a reference to a general contract, the one made with an operator (for example a mobile telephony operator or a bank card group, for the payment aspects)).

The invention consequently applies to any transaction system which can be used by several operators. The invention applies in particular to radio telephony, banking networks and transportation systems.

It enables the clients of an operator to use indifferently the services and/or infrastructures of another operator in a manner which is transparent to the user.

In the case of mobile telephony systems, a user who has entered into a contract with a telephony operator can make telephony transactions using equipment of another operator or operators or a user of the telephone network.

In the case of banking systems, the customers of several banks can effect transactions with the equipment of these banks or a user of the banking network without connection to an authorisation centre.

In the case of public transportation systems, the customers of several transporters can use indifferently the means of transportation of these operators with transportation rights issued indifferently by these operators and able to be used without distinction on each of the transportation means.

It is known that, in the service provision systems offered by major operators for the public, there are different operating modes enabling the operators to have a more or less captive customer base.

For example, in the case of cellular telephone systems, the networks are completely distinct and a user can use only the network of the operator to which he has subscribed unless there is specific agreement between the said operators. This solution is for the moment viable since, because of the large number of subscribers, the operators can afford to have networks

which are either superimposed or substantially continuous. It is however quite clear that, for areas with a low population density, and because of this badly served, it would certainly be desirable for the clients to be able to access the different networks, in a transparent manner if possible, in order to ensure a truly complete coverage on economically acceptable terms. This of course poses the problem of charges and the invoicing of calls passing through a network to which the subscriber does not belong. This problem is particularly crucial because of the trade war currently going on between the operators and which results in their having a large number of distinct invoicing methods according to the operators, and ones which are frequently variable.

An example of multiple access is currently encountered in the cabled telephone network, for which there exists, in the recently liberalised countries, only one physical network belonging to a historical operator. The customers who wish to use the services of another operator must necessarily pass through the existing physical network and identify the operator which they wish to use by means of a prefix. In fact even the switching systems belong to the historical operator owning the physical network and the other operators merely rent the communication routing capacities, which they then resell to their customers. They make their revenue on the difference in price between the wholesale renting and the retail. It can be seen that the invoicing system is based essentially

on the processing of data concerning the actual communications, data which are collected by the historical operator and then communicated to the new operators. It can be seen that the new operators are thus completely bound to the historical operator and must trust him with regard to the validity of the data received, which is not without drawback between direct competitors.

One of the major current problems is that of the use of public transportation by users who wish, using a ticket purchased for example from a railway company, then to be able to use the underground, then a bus - and even any combination of these different transportation means, whether or not operated by distinct operators.

Currently, for individual tickets, the tendency for the different transporters is each to sell their ticket for their portion of the journey. This solution is manifestly unsatisfactory. It would be even more so for subscriptions, which has led to the setting up of systems of the travelcard type.

The distribution of receipts originating from this subscription system is effected on a statistical basis, always subject to guarantee.

There is therefore a serious problem of interoperability, this term being defined as the possibility for a user, from a ticket or subscription right purchased from the transporter who suits him the best, to be able to use all the other transporters in

his region, within limits of time and distance defined by the initial ticket.

It should be noted that this problem has been resolved in the case of bank cards (of the debit card type), but the solution adopted, of the pyramidal type, comprises a single operator who federates all the banking parties and who remains anonymous to the user. The latter uses a card issued by his bank, which is in fact common to everyone and is distinguished only by decorative aspects.

This system has the drawback of requiring good agreement between all the federated parties in the common organisation. This good agreement is obtained only at the cost of a certain degree of effacement of the smallest partners. In spite of everything it gives rise to a lack of flexibility and ability to react in the face of desirable concrete changes.

Ins a2 In order to mitigate these drawbacks of these systems, which are termed "ticketing" systems, the invention proposes a multi-operator ticketing system which comprises first means specific to a first operator for acquiring the content of a ticket issued by this operator and for authorising a service according to the information acquired, principally characterised in that it also comprises second means, referred to as "consulate" means, for receiving the information when they come from a ticket issued by another operator and for transmitting to the first means a simple authorisation to render the said service

according to the information thus known and processed in a manner specific to the consulate.

According to another characteristic, the service authorisation is dependent on the prior performance of a transaction.

According to another characteristic, the methods of processing information by the first means and the consulate are concealed with respect to each other.

According to another characteristic, the consulate is physically included in the first means.

According to another characteristic, the consulate is physically external to the first means.

According to another characteristic, the system comprises a central unit and a set of remote stations intended to know the content of the tickets and to perform the transactions and connected to the central unit by first transmission circuits.

According to another characteristic, each remote station comprises a consulate.

According to another characteristic, the central unit comprises second transmission circuits for transmitting, to the central unit of the other operator, the data corresponding to the transactions performed on behalf of this other operator.

According to another characteristic, the central unit comprises third transmission circuits for transmitting, from the central unit of the other operator to the consulate, the information concerning the modes of processing, by the consulate, of the information carried on the ticket.

According to another characteristic, the system is applied to a system of public transportation and the remote stations are validators for access to the transportation vehicles. In this case, the tickets are information carriers such as tickets with a magnetic strip, plastic or cardboard, or smart cards with or without contact.

According to another characteristic, the system is applied to a mobile telephony system and the remote stations are radio telephone network base stations, the information carried by the tickets being read by mobile telephones and transmitted to the base stations.

In this case, the tickets are in the form of portable telephone - associated mobile telephony smart card (GSM or UMTS standards).

According to another characteristic, the system is applied to a banking system and the remote stations are distributed terminals, the information carried by the tickets being read by the dispensing terminals.

In this case, the tickets are in the form of credit cards, with a chip or magnetic strip.

According to another characteristic, the system is applied to systems with different purposes.

In fact, the system can be applied to transportation and parking systems or to transportation and commercial loyalty systems.

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Other particularities and advantages of the invention will emerge clearly from the following description, presented by way of non-limitative example with regard to the accompanying drawings, in which:

Figure 1 depicts the simplified block diagram of a system according to the invention;

Figure 2 depicts the block diagram of a system according to the invention applied to a mobile telephony network belonging to an operator distinct from the telephony operators;

Figure 3 depicts the block diagram of a system according to the invention applied to a banking network belonging to an operator distinct from the banking operators (the banks).

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The invention applies to all transaction systems able to be operated by several operators as stated previously in so far as ticketing system means a system in which there is a dual one transaction - one contract association (the case of transportation) or in cases where there is a multiple one contract - n transactions situation (that is to say each time there is a transaction there is reference to a general contract, the one entered into with the mobile telephony operator (the mobile telephone (GSM or UMTS)), or with the bank card group, for the payment aspects.

In addition, in order to simplify, the term "ticket" will be used for any means, physical or otherwise, allowing access to a "ticketing" system as defined above. Different possible forms are illustrated using examples of applications of the invention given hereinafter.

Figure 1 depicts the block diagram of a ticketing system according to the invention, in a variant limited

to the case where the operator Y accepts the customers of an operator X.

Figure 1 will be described with regard to a transportation system by way of example. Naturally, this diagram also applies to a mobile radio telephony system or to a banking network system.

In this simple version, the operator Y has a central unit 101 which provides the regulation of the entire system. This central unit is connected by links 102 to a set of remote stations 103 in which the services are operated. To give an idea, the central unit 101 is situated in the centralised service building of an urban bus company, and the stations 103 are the validators 110 situated in the bus, which authorise access for passengers to this bus. According to the size of the business, the simple links which are shown in the figure will be branched, with concentrators and intermediate processing devices.

In the ordinary functioning of the operator Y, a customer of this operator Y who gets into the bus validates his ticket 104 issued by Y, a smart card with contactless connection for example, by presenting it to the validator 110. The validator recognises the ticket, tests its validity for date, route etc and authorises the traveller to pass, for example by switching on a green light. In other circumstances, such as for example access to an underground station, the validator will for example actuate a turnstile.

Although it is possible to imagine using a validator provided with a minimum amount of

intelligence and effective validation at the unit 101 after transmission of the data over the link 102, and then retransmission of the authorisation by this same link, the most commonly used solution consists of providing the validator with sufficient intelligence, that is to say a computer which is sufficiently powerful and provided with sufficient memory to deal with the problem of validation locally in the station 103 itself.

The problem of interoperability consists of a traveller provided with a ticket 105 issued by the other operator X receiving from the validator 110 authorisation for access to the bus after having presented his ticket 105, without the processing resulting in the granting of this authorisation by the system Y being effected by the system itself in an identical fashion to the processing resulting in the issue of the authorisation given to the bearer of the ticket 104.

This is because such a processing mode would enable the operator Y to know the entire commercial policy of the operator X, as well as the characteristics, possibly including the name, of a major part of the customers of X. He could for example determine that certain customers of the operator X benefit from a particularly advantageous tariff and are major consumers, whom it would then be advantageous to approach directly.

The invention therefore proposes to delimit, in the station 103, a sub-assembly 106, which for the

convenience of the description will be referred to in the remainder of this text as a "consulate".

Depending on the embodiments of the invention, this consulate 106 can be formed by hardware means and/or software means distributed variably according to the requirements of implementation and/or the needs of distinct operators. The essential point is that the consulate 106 constitutes a structure which is sufficiently isolated with respect to the remainder of the station for the exchanges between these two parts to be strictly limited by the intent of the two operators, so that neither of the two can have access to the confidential data contained in the part reserved for the other.

According to other examples, the consulate can be in the unit 101 or between the unit and the stations.

The consulate 106 therefore comprises everything necessary for being able to decode the information contained on the ticket 105 issued by the operator X and validate access on board the bus for the traveller provided with this ticket 105.

The part of the station 103 reserved for the operator Y additionally includes, with respect to the situation where there is no consulate in this station, only the elements which are strictly necessary, a few lines of computer code for example, in order to be able to effect exchanges with the consulate 106, which are very simplified.

In more detail, when the validator 110 notes that the ticket 105 which is presented to it is a ticket of

the operator X, it immediately transmits to the consulate 106 the information which is read on this ticket, and which in principle has no signification for it since the essential data, the type of transportation contract for example, can very well be represented only by a few bytes, whose meaning is known only to the operator X, the said information being able to be accompanied by logistic data such as date and place.

The operator X then effects his validation processing, which in principle is similar to that effected by the validator 110 for the tickets 104, and retransmits to the validator the acceptance, or if appropriate the refusal, of access on board the bus. The validator then authorises, or refuses, access to the traveller.

Where necessary, for complex transportation systems, this acceptance is supplemented by a few data making it possible to qualify more profoundly the type of service rendered by the operator Y to the traveller of the operator X, for example an indication of actual travel distance covered.

These data are then transmitted to the central unit 101, either directly, or in non-real time, after storage throughout the day for example, by the link 102. They will then be transmitted from the central unit 101 of the operator Y to the central unit 201 of the operator X, so that the latter can manage his own customers and remunerate the operator Y for the services rendered to these same customers. This remuneration will take place according to an agreed

method which consists essentially in defining a particular tariff for each service rendered by the operator Y to the customers of the operator X. This corresponds to a particular tariff between the operator X and the operator Y, without the commercial agreements made between the operator X and his own customers playing any part, nor being known to the operator Y.

In the figure, this transmission has been represented by a link 107 from the central unit 101 to the central unit 201, but in practice it can be effected by another means, for example by the exchange of magnetic tapes, as is practiced between banks for compensation operations.

The consulate 106 therefore comprises a certain number of data, relating to tariff for example, liable to vary more or less frequently. In the example described for a bus transportation system, these changes are relatively infrequent, but they may be much more frequent in other applications, for example in systems for telecommunication by cellular telephone.

To facilitate the updating of these data, the invention also proposes to have them pass from the central unit 201 of the operator X to the consulate 106 contained in the terminal stations 103 by means of the central unit 101 of the operator Y and its links 102 with the stations 103.

For this purpose, these data, and more generally the entire programming of the consulate 106, are transmitted from the central unit 201 to the central unit 101 by means of a link 108, which is here

represented in a cabled fashion as the link 107, which can also use other means such as an exchange of magnetic tapes. These data will then be transmitted by the central unit 101 to the consulate 106 by means of the links 102 and the other components of the station 103.

Naturally, in order to keep the confidentiality of these data, for which this entire system was designed, this communication will take place by means of an encrypting system of a known type. Use will be made for example of a security application module known by the abbreviation SAM.

The invention also proposes to use such an SAM system for sending, from the consulate 106 to the central unit 201, a certain number of data relating to the customers provided with the ticket 105 and where the operator X does not wish for them to be known to the operator Y.

It is clear that, as described, the system requires a minimum of hardware and software compatibility between the ticketing systems of the operator X and of the operator Y.

Thus, in this example, the tickets 104 and 105 must be of the same type for the reader to be common. Likewise, the consulate must function under the same operating system as the remainder of the station 103.

The invention is however not limited to such a close compatibility. It extends to systems where the hardware and software would be much more different, but in accepting a complication in design and a cost which

is all the greater, the more this difference is accentuated.

It would thus be possible to have a ticket 104 with contactless reading and a ticket 105 with magnetic reading, therefore requiring two distinct readers. In this case, the outputs of the readers could be connected to a validator 110 and to a consulate 106 which are physically distinct, solely connected by links allowing the minimum of exchanges described above.

This solution would make it possible to increase security vis-à-vis intrusions on one operator by the other, but it would be noted immediately that it gives rise to a fairly unadvantageous proliferation of hardware.

This proliferation of hardware will be even less advantageous if not two operators X and Y are involved, as described above, but a set of operators X, Y, Z …, a situation in which the invention applies perfectly since it then suffices to have one consulate per external operator. This situation is fairly infrequent in the case of public transportation, but it can be much more frequent in other applications of the invention, for example in cellular telephone systems.

In practice, having regard to standardisations currently existing with the suppliers of components used for constructing the system, it is easy and without drawbacks to avoid such a proliferation.

Figure 2 illustrates a multi-operator ticketing system according to the invention applied to GSM or

UMTS mobile telephony networks in the case where the networks belong to an operator Z.

In fact, as stated above, the concept of neighbouring interoperability applies also to a mobile telephony environment in which the physical network is usable by distinct operators (the network belonging either to one of these operators or to an operator distinct from them and renting his infrastructure to these operators).

In this case, the consulate 106 takes the form of a component installed in the means 103, which are means specific to the network, namely the equipment of the base cell. The consulate 106 makes it possible to begin the dialogue between the pair consisting of smart card 105 and portable telephone TX (or smart card - telephone TY) and the network according to the same principle of identification of the operator X (or Y) issuing the smart card, identification of the user, recognition of his rights to consume and then recording of the data relating to the transaction.

According to the same methods these data, possibly encrypted (apart from those necessary for the operator Z of the infrastructure to claim payment from the operator concerned X (or Y), are recorded either at the base equipment or at the central system Z of the network operator for subsequent restitution to the operator X (or Y).

It is clear that this operating principle is distinct from that currently recommended in industrialised countries, where each operator is the

owner of his infrastructures, but it has a certain advantage for countries in which the infrastructure installation costs pose a serious problem.

Figure 3 illustrates a multi-operator ticketing system according to the invention, applied to banking networks in the case where the networks belong to an operator Z.

In fact, this concept of neighbouring interoperability applies also to a banking environment in which the stations 103 are the distributed terminals belonging to a bank and able to be used by distinct bankers without, in contradistinction to the system existing in France, there being any need to connect to an authorisation centre.

In this case, the consulate 106 takes the form of a component installed in the means 103, which are specific means of the banking network (the dispensing terminals). The consulate 106 begins the dialogue between this terminal 103 of a bank Y and the bank card 105 belonging to another bank X according to the same principle of identification of the bank issuing the card, identification of the user, recognition of his rights to consume and then recording of the data relating to the transaction.

According to the same methods these data, possibly encrypted (apart from those necessary to the operator of the infrastructure for reclaiming a payment from the banker concerned), are recorded at the bank terminal, and then repatriated to the central system of

the operator X of the network for subsequent restitution.